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ABSTRACT

The Automated Braille System (Autobraille) is a tactile communication mode that uses the computer and other mechanical devices to enable visually handicapped children or adults to read from a tabletop instrument. Five problems associated with standard braille books which may be circumvented with Autobraille are storage space requirements, weight of braille books, deterioration rate of braille surfaces, high production costs, and unsuitability for electronic communication. Component parts are a table-top display device, a control unit, and a tape cartridge. In addition to converting tape signals to the tactile reading display, the system also generates tapes for storage through two computer programs. One transforms an alpha-numeric natural language text to codes corresponding to the 63 braille character combinations in Grade II braille; the other program transforms the computer's codes into a tonal code (similar to the Bell system's touch tone), and also tonally separates characters on the display device's reading line. Autobraille is capable of transmitting data through the telephone at 1000 words per minute and thus has potential for library to user transmission. (MC)

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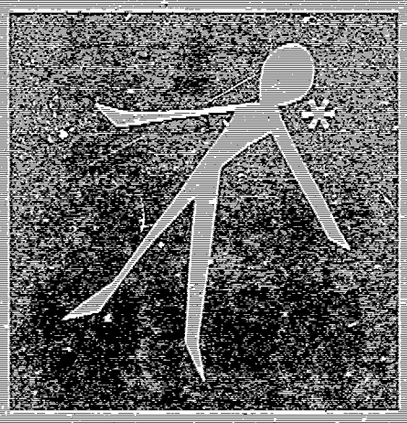

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AUTOMATED BRAILLE SYSTEM (AUTOBRAILLE)

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AUTOMATED BRAILLE SYSTEM (AUTOBRAILLE)

The Automated Braille System is a mode of tactile communication of text materials without the use of paper, but using the computer and other mechanical devices to form a new alternative to braille books.

General Purpose AUTOBRAILLE is intended to provide solutions for five of the problems associated with standard braille books:

1. Storage space requirements
2. Portability (as restricted by the bulk and weight of braille books)
3. Deterioration rate of braille surfaces
4. High production costs
5. Unsuitability for electronic communication

AUTOBRAILLE allows the visually handicapped person to read from his own table-top instrument using essentially the same physical habits and techniques which he used for an ordinary braille book. The "display" is electronically actuated from control information stored on a tape recording in a nearby control unit. The controlling tape is reproduced from a master tape which has been generated by a computer working from the original natural language on punch-cards or perforated tape. Thus the AUTOBRAILLE's purpose, simply stated, is to make available a small, light-weight medium which provides for braille reading while eliminating braille production of the classical sorts.

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General Description The AUTOBRAILLE system is best described in its two separate aspects: 1) generation of tapes for storage of braille-transducing signals and 2) conversion of tape signals to tactile-reading display.

1. Generating-tonal Storage Tapes. There are two major computer operations in the AUTOBRAILLE system. These require two unique software components and one unique peripheral hardware unit. (The two programs could be integrated or, as described here, designed to function sequentially with a computer storage of the primary output before treatment on the second program.) Program I transforms an alpha-numeric natural language text to codes which correspond to the 63 braille character combinations used in Grade II Braille. Program II transforms the computer's intermediate codes for the Grade II Braille symbols into a tonal code similar to that used in Bell System "Touch Tone".[c] Thus the processed data from this second program must be output off-line through a specially-designed component which, in turn, can be recorded by an audio-range tape recording device. Another function of program II is to introduce tonal "marks" to separate the 30 characters of a standard line of the display instrument.

The major advantage of the tonal (audio-range) output is to enable the coded data to be stored, duplicated and electronically transmitted, utilizing low-cost processes for all functions. Once the master tonal tape for a document is produced, the computer is no longer required. Subsequent operations are all handled by small and inexpensive recording and display devices.

2) Converting the Tonal Data into Tactile Display. The visually handicapped user of the AUTOBRAILLE system manipulates three pieces of apparatus: 1) a 7-inch reel of ¼" audio tape which holds the tonal data representing a given document, 2) a table-top display device (DD) about 3 x 20 x 4 inches which is the variable display of a line of 30 braille characters, and 3) the control unit (CU) which is the size, weight and general appearance of a portable tape recorder.

The control unit (CU) is an automatic device which is actuated from the display device. In operation, the CU "reads" a "line" of braille code activates "lifters" in each of the cells of the characters on the DD and stops at the tonal mark which denotes a line's end. As the user hits the "next-line-please" button at the right end of the DD the CU signals "unload" to the DD, neutralizing all "lifters". The tape then "reads" the next segment of tape, loads the DD cells, and pauses at the next "line's-end'mark" on the tape.

A "back-up-please" button at the left end of the ED triggers a rapid back-up-two-line's-end marks function and loads from thereafter returning to forward mode.

The Display Device is a reading surface with one line of 30 "6-dot" character matrices, using the standard literary braille character spacing and size. The "lifters" are covered with a strip of .5 mil mylar tape 3/4" wide. Thi. strip of tape (on reels like a typewriter ribbon) protects the mechanism from finger-borne oils and dirt and provides for a sanitary refreshing of the device between users.

Actuation of the lifters is electro-magnetic and the rapid-load circuits are electronic, pulse-actuated from the control unit. In this operation, the control unit delivers six binary signals to each of the cells, left to right, in turn. These trip relays in the Display Device remain in actuation (or non-actuation) until to "unload" signal is received.

Operating Characteristics AUTOBRAILLE is designed to minimize the problem of converting reading habits to a new configuration. The user needs only to slide a tape cartridge into the control unit, and to operate a power switch and two control buttons located on the Display Device at either end of the line of

braille characters. Other than these simple tasks, his reading techniques will not require modification--except that as he returns his hands for the next line he will not move down, because the next line will appear in exactly the same location as the previous line.

The tape moves rapidly when the "next-line-please" button is pressed. The unload and reload cycle is completed in less time than that required for the user to move his hands from the right end of the device back to the left end.

Telephonic Transmission of AUTOBRAILLE Documents One of the major advantages of the AUTOBRAILLE is its capability of low-cost electronic transmission of braille data. Using the simplest of all commercial transmission devices, the telephone line, AUTOBRAILLE tonal data can be transmitted at the probable rate of 1,000 words per minute. Using high speed transducers and wide-band equipment (cables or microwaves) transmission between libraries at much higher speeds become possible.